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DIRECTORATE OF
SCIENCE & TECHNOLOGY

Scientific and Technical Intelligence Report

Free-World Sounding Rockets, Ballistic Missiles, and Satellite Launch Vehicles

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February 1969

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FREE-WORLD SOUNDING ROCKETS, BALLISTIC MISSILES, AND SATELLITE LAUNCH VEHICLES

FMSAC-STIR/69-1

February 1969

CENTRAL INTELLIGENCE AGENCY

DIRECTORATE OF SCIENCE AND TECHNOLOGY

FOREIGN MISSILE AND SPACE ANALYSIS CENTER

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PREFACE

This handbook contains, in a single document, the technical characteristics, flight test history, and performance capabilities of the principal ballistic missile and space rocket systems that have been developed outside the US, the USSR, and Communist China. The systems presented include sounding rockets used primarily for space research, special military test vehicles, satellite and other space launching systems, and ballistic missiles. Designs in these categories are included if they were expected to reach the flight-test stage before the end of 1968.

The basic criterion for inclusion of particular systems within the above categories is a range (or altitude capability with a useful payload) of 100 nautical miles. Several countries not listed in the Handbook are conducting scientific rocket firings, including Brazil, India, Norway, Pakistan, and Spain. In these cases the rockets being fired are US or French rockets, or if of native design, are well below the criteria listed above.

Much of the data in this handbook comes from unclassified sources, but all available information has been used. The cutoff date for research was 1 October 1968.

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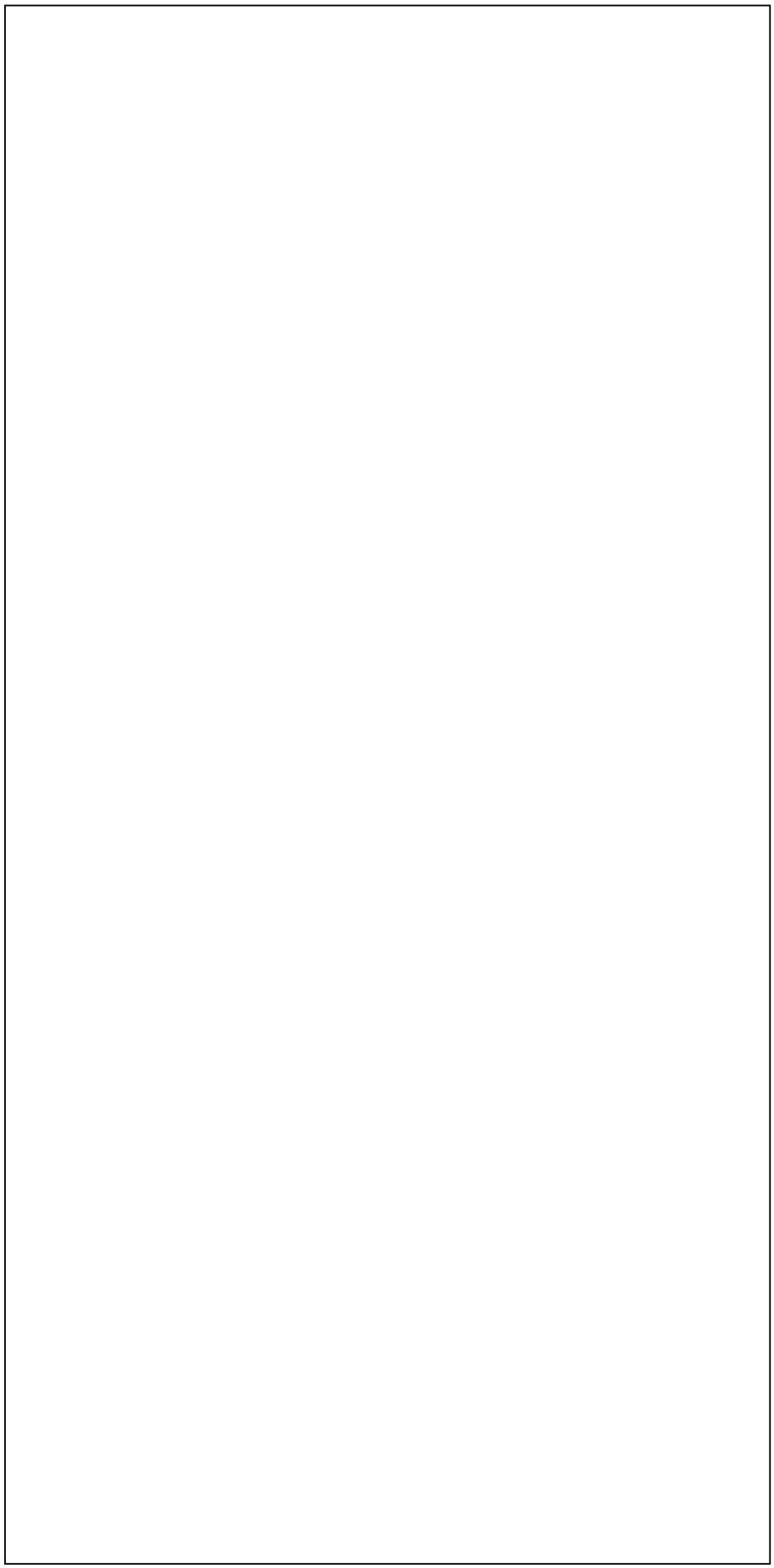

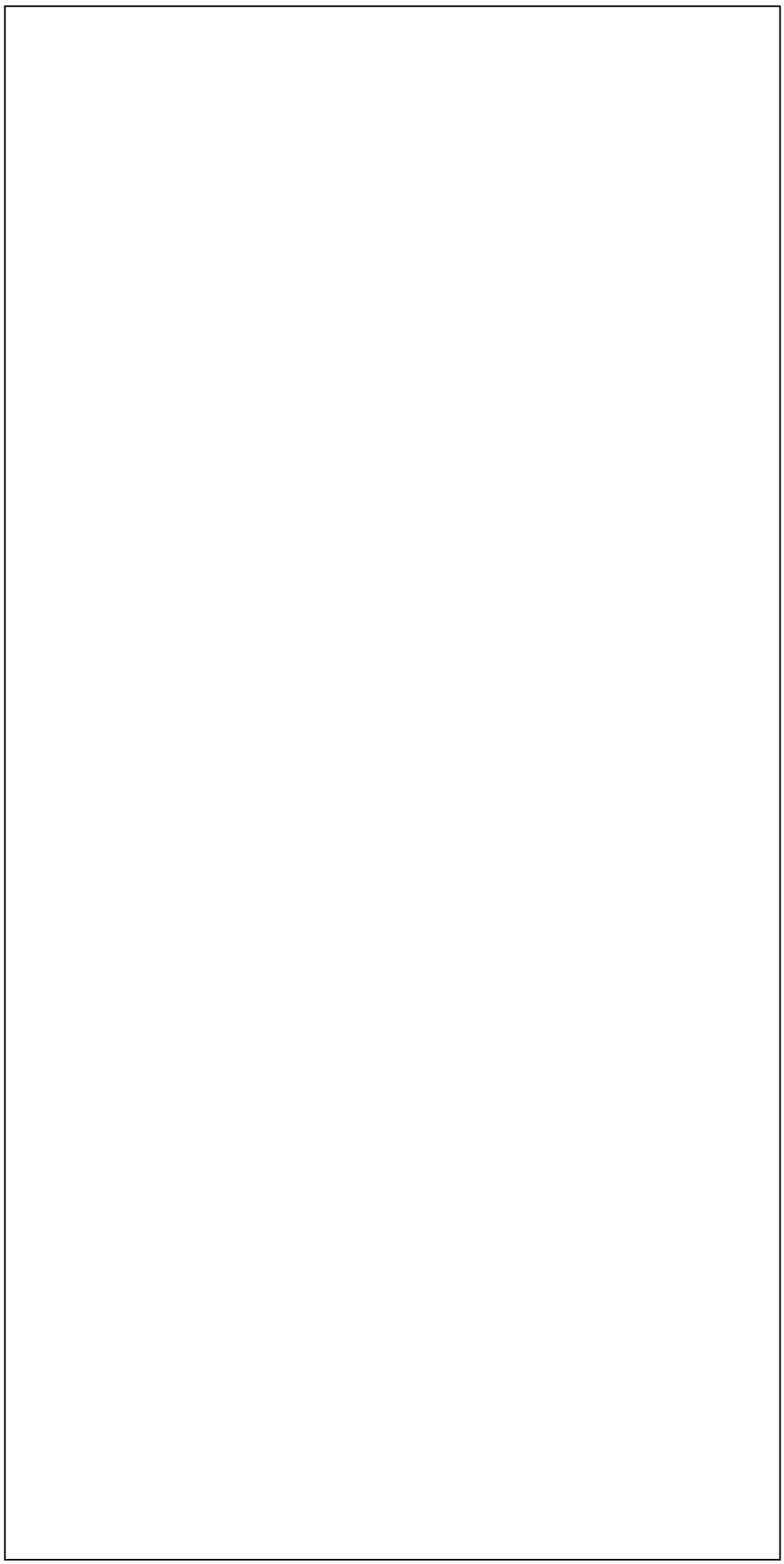

ISRAEL

MD-620 (JERICHO) SHORT-RANGE BALLISTIC MISSILE

The French/Israeli short-range MD–620 is a mobile system based on two tandem solid-propellant Topaz motors. The Topaz was the second composite propellant motor* developed by the French and was the first to be guided by an autopilot controlling four gimbaled nozzles. The motor case is constructed of steel, and the composite propellant consists of ammonium perchlorate oxidizer and aluminum and polyurethane fuel—the same constituents used in at least some of the IRBM motors.

The first stage is very similar to the NA 803 Topaz motor but with the thrust termination devices omitted. The second-stage motor differs somewhat from the first stage. The four rotating nozzles, which protrude beyond the motor case, have been replaced by a single fixed nozzle. Control of second stage is achieved by aerodynamic fins. The thrust termination ports have been retained on the second stage to reduce the range.

The missile probably uses an inertial guidance system, somewhat similar to that used in the French silo-launched missile. This could result in a CEP as small as about 2,000 feet at a range of 300 nautical miles. For a missile with this short range, however, an autopilot could be developed to produce a CEP of perhaps between one and two nautical miles.

Reportedly, at one time the Mirage IV nuclear weapon was to be modified for installation on the MD–620 which probably means a reentry vehicle weight of about 3,000 pounds. Use of the Mirage IV weapon now seems unlikely, and it appears that if a nuclear device is developed by the Israelis, it will have a diameter of about 25 inches and a lighter reentry vehicle weight. Such a weapon could be installed in a reentry vehicle with a length of about five feet if ballasting were used. A wafer section containing flaps is attached to the rear of the reentry vehicle in order to stabilize the RV on reentering the atmosphere. Because of the missile's short range the reentry vehicle design is not expected to present any significant difficulties.

Two modes of deployment are being considered by the Israelis. One is a missile-under-mountain concept (MUM) where the missiles would be emplaced in tunnels in the side of hills and mountains and rolled out and erected to be fired. The second mode will utilize a semitrailer transporter-erector-launcher (TEL) towed by a wheeled tractor which also is the launch control center. Its total length is reported to be about 60 feet and its width 8.2 feet. Each missile unit will consist of four of these TEL's each carrying one missile. Three additional missiles for each TEL will be carried on tractor-trailers, one to each vehicle, for a total of 16 missiles per launching unit. Reload and relaunching time is about one hour; thus, four missiles can be fired from each TEL in

* The first composite motor developed was the Agate (NA 801) which was unguided. It uses a composite propellant consisting of polyurethane and a ammonium perchlorate but has no aluminum.

about three hours. The missile is erected by a hydraulic control system mounted on the trailer. The missile will be enclosed in an environmental cover which is removed before firing. The countdown will normally require about 30 seconds. The time to fire from a road march condition is unknown.

The flight test program for the MD-620 began early in 1965 at the Ile du Levant Missile Test Range. Very little information on flight tests has been obtained [redacted] but the program probably has been completed. The system probably will be produced in Israel with some of the components purchased from France.

CHARACTERISTICS OF THE MD-620 SRBM
(values are approximate)

DEVELOPING ORGANIZATION — Avions Marcel Dassault

CONFIGURATION — Two-stage tandem

MAXIMUM BASIC OPERATIONAL RANGE (NRE) — 270 nm (2,000 lb r/v)

TOTAL LENGTH — 45 ft

REENTRY VEHICLE LENGTH — 14 ft

GROSS WEIGHT AT LIFT-OFF — 14,400 lb (2,000 lb r/v)

GUIDANCE SYSTEM — Probably inertial

ACCURACY — CEP of perhaps 2,000 ft at 300-nm range

DEPLOYMENT — Mobile (TEL)

INITIAL OPERATIONAL CAPABILITY — 1969

Stage Characteristics—

	1ST STAGE (Topaz)	2ND STAGE (Modified Topaz)	GUIDANCE SECTION
Length (ft)	14.5	16.5 (including guidance section)	2.0
Diameter (in)	31.5	31.5	31.5
Total weight (lb)	5,900	6,100	400
Propellant weight (lb)	5,000	5,030	
Structure weight (lb)	900	1,070	
Propellant weight fraction	0.85	0.82	
Burn time (sec)	42	43	
Thrust (lb)	29,000 (sl)	34,000 (vac)	
I_{sp} (sec)	221 (sl)	253 (vac)	

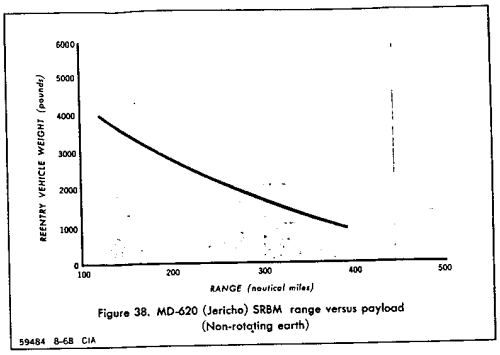

Figure 38. MD-620 (Jericho) SRBM range versus payload (Non-rotating earth)

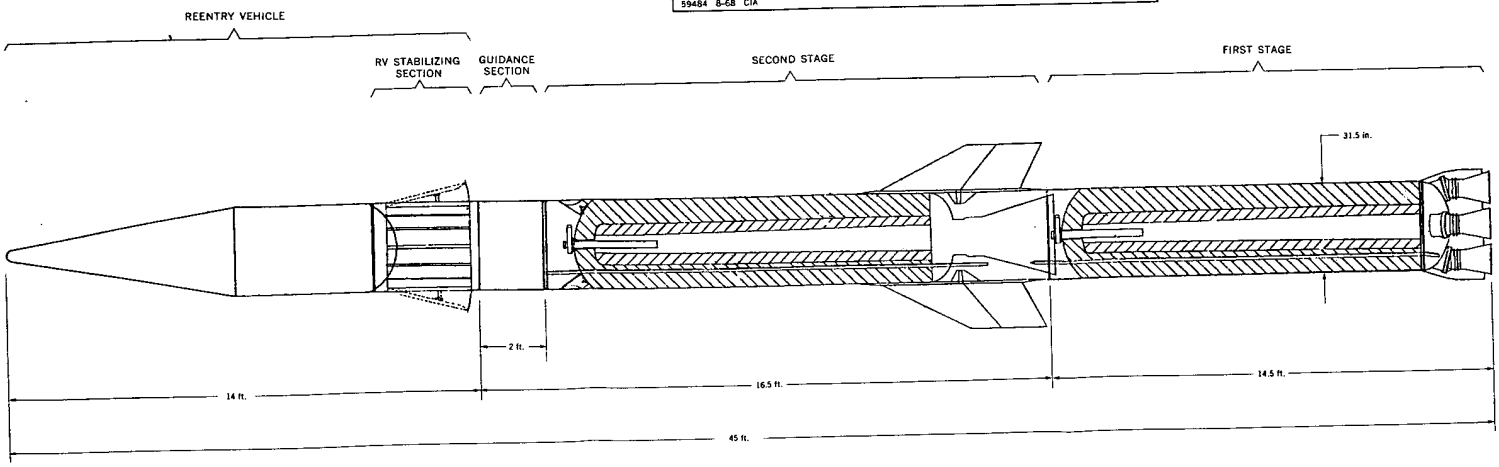

Figure 39. MD-620 (Jericho) short-range ballistic missile

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